

REMARKS

Claims 23 and 30-42 are cancelled.

Claims 43-107 are added.

Accordingly, claims 43-107 are now pending.

Original claims 21-26 and 28-33 are presented in slightly modified form as new claims 43, 47-51, 53-55 and 56-58. Independent claim 43 comprises original claim 21, and further defines a gate conductor as comprising doped polysilicon over a gate oxide layer and *not OK* [a metal layer over the doped polysilicon]. The recited gate structure is described in the specification at page 11, line 22 through page 12, line 3 with reference to FIG. 7.

not OK Dependent claims 44-46 and 52 define various relationships of an upper metal layer and insulating layer over the gate, as shown in FIGS. 11-13 and described at page 12, line 27 through page 16, line 8.

OK Dependent claim 56 defines an interdigitated relationship for the gate and the source structures as shown, for example, in FIG. 3 and described at page 10, lines 14-15; at page 11, lines 13-14 with reference to FIG. 5; at page 12, lines 8-11; at page 12, line 27 through page 15, line 7 with reference to FIGS. 11-12; at page 20, lines 2-6 with reference to lateral devices; and column 16, lines 63-65 of U.S. Pat. No. 5,262,336 as incorporated at page 9, lines 15-17.

not OK Dependent claims 60-65 further define various configurations for the gate conductor, e.g., as comprising aluminum over polysilicon, plateable metal over polysilicon, et al. over silicide over polysilicon. Such metals and gate structures are disclosed, for example, at page

9, lines 15-17, by the incorporation of U.S. 5,262,336 at column 11, lines 60-63, column 22, lines 44-45, column 23, lines 63-68, and column 24, lines 18-22; and at page 14, lines 13-14, by the incorporation of U.S. 4,895,810 at column 10, lines 22-31 and 42-45, and column 12, lines 25-58, and column 13, lines 9-12.

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Dependent claim 66 further defines the insulating layer as comprising one of oxide, oxy-nitride, nitride, glass or phosphosilicate glass, as shown in FIG. 7 and described at page 12, lines 1-3; and at page 14, lines 13-14, by way of incorporated U.S. 4,895,810 at column 10, lines 56-59 and column 11, lines 15-16; and at page 9, lines 15-17, by way of incorporated U.S. 5,262,336 and its disclosure including column 24, line 61 to column 27, line 50.

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New claims 67-70 and 89-90 correspond to portions of claims 1-4 of U.S. 5,045,903. For example, new independent claim 67 corresponds to claim 3 of '903, re-written in independent form and to include portions of its base claim 1, omitting features not essential to the combination with claim 3. U.S. 5,045,903 issued from US application serial no. 07/439,101 which is a divisional of U.S. application serial no. 07/194,874, filed May 17, 1988, now U.S. 4,895,810, which is the grandparent of the present application.

Dependent claim 71 further defines the metal layer of the gate structure as substantially co-extensive with the doped polysilicon. Support for such gate structure is provided by the disclosure of the present invention, for example, at page 11, line 27 to page 12, line 1 with reference to FIG. 7; as described in U.S. 4,895,810 at column 10, lines 22-26 and 42-43, column 12, lines 25-35 and 47-58, and column 13, lines 9-12; and as described in U.S. 5,262,336 at column 11, lines 60-63, and column 16, lines 57-58.

Dependent claims 72-74 further define a metal layer of the gate structure or the source conductive layer as comprising aluminum. These structures are described in the present

disclosure, for example, in U.S. 4,895,810 at column 10, lines 22-26.

Dependent claims 75 and 78 further define dielectric and metallization over the gate conductive layer as disclosed, for example, in FIGS. 12, 13, 20 and 21 and described at page 14, lines 22-28, and page 15, lines 8-22; and in U.S. 5,262,336 at column 15, lines 9-14, 40-44 and 51-54.

Dependent claims 76, 79, and 81-86 further define features of dielectric or metal as supported by the disclosure of the present invention, for example, as referenced above relative to claims 60-66.

Dependent claims 77 and 80 define the dielectric as two layers of dielectric, as supported by, for example, incorporated U.S. 5,262,336 at column 24, line 61 through column 27, line 50.

Dependent claim 87 defines the gate metal layer as comprising two layers of metal, as supported by incorporated U.S. 4,895,810 at column 12, lines 47-56.

Dependent claim 88, further defines a trench of the substrate surface and a source portion of the double-diffused dopant means configured relative thereto. This structure is supported by the disclosure of, for example, incorporated U.S. 4,895,810, at column 10, line 1 through column 11, line 16.

Dependent claims 91-92 recite features corresponding to claims 15-16 respectively of 5,045,903. Again, applicants note that U.S. 5,045,903 issued from a divisional application 07/194,874, filed May 17, 1988, which issued as U.S. 4,895,810 – i.e., the grandparent of the present application.

Dependent claims 93-97 recite features having support in the disclosure of the present

invention pointed out above relative to claims 74-77.

New claims 104-107 have been added in order to claim more fully certain features of the present invention. Applicants believe that these claims find support within the present application, including incorporated U.S. 5,262,336 and incorporated U.S. 4,895,810.

The Rejections Under 35 USC §112:

Claims 33 and 38 were rejected under 35 USC §112, first paragraph. In rewriting portions of claim 33 into claim 59, applicants removed the language “the first trench has a predetermined depth within the first layer.” Accordingly, it is submitted that the §112, first paragraph rejection is moot.

Claims 23 and 30-38 were rejected under 35 USC §112, second paragraph. Although applicants believe that these original claims were sufficiently definite to point out and distinctly claim subject matter of the present invention, certain changes have been made in an effort to advance the present application to issuance. More particularly, in rewriting portions of claim 31 into claim 57, applicants replaced “first trenches” with “first trench,” “layers” with “layer,” and defined each first trench as containing the gate oxide and gate conductor.

Applicants submit that claims 43-97 meet the requirements of 35 USC §112.

The 35 USC §103 Rejections:

Claims 23 and 30-42 were rejected under 35 USC §103 under Sakamoto and variously

Applicants submit that the cited references of record do not disclose or suggest the respective combination of features that are now defined in claims 43-66 of the present application.

Likewise, applicants believe that the cited references of record do not disclose or

suggest the various combinations as are defined in claims 67-97 or 98-105.

Moreover, as noted earlier herein, support for independent claims 67 and 98 can be traced back to 4,895,810, which has priority dating back to as early as May 17, 1988.

Accordingly, Sakamoto and Davies are unavailable relative thereto.

In light of the newly submitted claims, applicants enclose herewith copies of US 5,486,715 and 5,801,419 to Zommer for benefit of the Examiner. Also submitted are copies of US 5,119,153 (Korman) and US 5,164,802 (Jones). Applicants submit that the claims of the present application are patentable over these references.

Finally, applicants submit concurrently herewith excerpts from two different text books of Duncan Andrew Grant and John Gowar, "Power MOSFETS: theory and applications," John Wiley & Sons 1989; and B. Jayant Baliga, "Modern Power Devices," John Wiley & Sons 1987.

Attached is a Version With Markings to Show Changes Made To Claims by the current amendment.

The application should now be in condition for allowance. If any questions remain, the Examiner is requested to call the undersigned.



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PATENT TRADEMARK OFFICE

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VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS

Claims 23 and 30-42 are canceled.

Claims 43-107 are added.